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MEMOIRS  
OF THE  
GEOLOGICAL SURVEY  
OF  
THE UNITED KINGDOM.

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*Figures and Descriptions*

ILLUSTRATIVE OF  
BRITISH ORGANIC REMAINS.

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DECADE III.

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PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

LONDON:  
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE:  
PUBLISHED BY  
LONGMAN, BROWN, GREEN, AND LONGMANS.  
1850.

## NOTICE.

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PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service.

The plan proposed to be followed in the work, of which this Decade forms a part, is as follows :—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the Maps and Memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,  
*Director-General.*

*Geological Survey Office, Jermyn Street,  
30th June, 1850.*

## BRITISH FOSSILS.

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### DECADE THE THIRD.

THE third Decade of representations of British Fossils follows up the subject of the first, and continues the series of illustrations of the genera and species of extinct Echinodermata, especially those belonging to the orders *Asteriadae* and *Echinidae*.

The genera illustrated in this Decade are partly new, partly long-established ; so also with the species, some of the most remarkable of unpublished forms having been selected, as well as some of the commonest and best known fossils. Yet, even respecting those which are so familiar that their whole history is believed to have been long ago made out, there is so much to be cleared up, so many points of structure hitherto very imperfectly or not at all elucidated, and such an accumulation of synonyms, that their investigation is much more laborious, and occupies much longer time, than inquiries into entirely new types. Thus, three of the fossils figured and described in this Decade, *Hemicidaris intermedia*, *Galerites albogalerus*, and *Micraster cor-anguinum*, are so familiar to geologists and naturalists, so abundant and so well preserved, that authors do not hesitate to cite them without comment, as if they were free from any obscurity. Nevertheless, I may say confidently, that not until now has the literature of these well-known and often-described forms been cleared up, and many of the most important points in their organization made known. Common as they are, no representations of them, presenting sufficient details of their structure, have ever appeared before.

Among the new forms now first described and figured, some are of singular interest. Two of them, the *Lepidaster Grayii* and the *Tropidaster pectinatus*, are not only new as species, but unquestionably possess features entitling them to become the types of new genera. Of those

belonging to old genera, the *Uraster Gaveyi* is singularly interesting, presenting, as it does, the spectacle of a Liassic echinoderm, which so closely resembles the commonest star-fish now living in the British seas, that it can only be distinguished from it by a minute and critical comparison; and the *Hemicidaris Purbeckensis* is remarkable as being the first member of its tribe ever discovered in strata of the Purbeck series.

The species described and figured have been selected from formations of different geological epochs. From Silurian rocks *Lepidaster Grayii* has been taken; from older secondary strata, the two forms of *Hemicidaris*, the *Galerites (Holectypus) hemisphærica*, chosen on account of its being new to Britain, and also affording an excellent illustration of the sub-genus to which it belongs, and the *Dysaster ringens*, selected for the same reasons; also the new star-fishes, species of *Uraster* and *Tropidaster*, already alluded to. Of cretaceous fossils there are the critical *Galerites castaneus*, and the characteristic *Galerites albogalerus* and *Micraster cor-anguinum*.

A third series of illustrations of the fossil Echinoderms is far advanced, and in preparation for publication.

EDWARD FORBES.

June, 1850.

# BRITISH FOSSILS.

## DECADE III. PLATE VII.

### GALERITES (GALERITES) CASTANEA.

[Genus GALERITES. LAMARCK. (Sub-kingdom Radiata. Class Echinodermata. Order Echinidæ. Family Cassidulidæ.) Body more or less hemispherical, always tumid; ambulacra simple, continuous, radiant; mouth central, inferior; anus inferior or sub-marginal; tubercles perforate.]

[Sub-genus *Galerites*. Body hemispheric, sub-globose, or conical; base more or less flattened; tubercles irregularly arranged.]

SYNONYMS. FORMA *a. major*.—*Nucleolites castanea*, ALEX. BRONGNIART, Env. de Paris, pp. 100 and 349, pl. 9, fig. 14. *Catopygus castanea*, AGASSIZ, Prodr. Ech., p. 18. *Pyrina castanea*, DESMOULINS, Tabl. Synon. des Echin., p. 258. *Galerites castanea*, AGASSIZ, Cat. Syst. Ech., p. 7; and Ech. Foss. de la Suisse, 1st part, p. 77, pl. 12, figs. 7, 9. DESOR, Monog. des Galerites, p. 23, pl. 4, figs. 12–16. AGASSIZ and DESOR, Cat. Rais. des Echin. Ann. Sc. Nat., 3rd series, vol. vii., p. 149. *Galerites Rothomagensis*, AGASSIZ, Cat. Syst., p. 7, (*fide* DESOR).

FORMA *β. minor*.—*Nucleolites depressa*, ALEX. BRONGNIART, Env. de Paris, p. 400, pl. 9, f. 17. *Catopygus depressus*, AGASSIZ, Prodr., p. 18. *Pyrina depressa*, DESMOULINS, Tab. Synon., p. 258. DESOR, Monog. des Galerites, p. 28. AGASSIZ and DESOR, Cat. Rais. des Echin., Ann. Sc. Nat., 3rd series, vol. vii., p. 150. *Galerites castanea*, AGASSIZ, Cat. Syst., p. 7 in part (*fide* DESOR). *Galerites rothomagensis*, E. SISMONDA, Echin. Foss. Nizza, p. 51, pl. 2, figs. 8–10. *Galerites lævis*, AGASSIZ, Cat. Syst., p. 72.? DESOR, Monog. des Galerites, p. 24, pl. 4, figs. 8–11.?

DIAGNOSIS. *G. corpore depresso, ovato seu suborbiculari, lateribus rotundatis; ano postico, supra-marginali; tuberculis omnibus sub-æqualibus; poris ambulacralibus ad orem laxè confertis.*

In the "Geology of the Environs of Paris" there are two cretaceous urchins from Savoy, figured under the names of *Nucleolites castanea* and *Nucleolites depressa*, which I take to be varieties of one species of *Galerites*, and to be identical with that which is here described and figured. The slight distinction in the degree of elevation of the anus above the margin, noticed by Brongniart, was not sufficient to establish a specific difference; and as the smaller form was styled *depressa* under the belief that it might be the *Galerites depressus* of Lamarck, the specific name *castanea* is adopted for both varieties.



This view, however, is not taken by continental authors, though originally held by Agassiz, who, in his Systematic Catalogue, regarded the *Nucleolites depressa* of Brongniart as one with that author's *N. castanea*, and placed them both under the name *Galerites castanea*. Desmoulins, in his "Tableaux Synonymiques," enumerates both as distinct, and places them in the genus *Pyrina*. Desor, in his Monograph of the *Galerites*, identifies *G. castanea* with the *Galerites rothomagensis* of Agassiz's Catalogue, but places in the genus *Pyrina* the *Nucleolites depressa* of Brongniart. In the "Catalogue Raisonné des Echinides" the authors keep the *G. rothomagensis* and *G. castanea* under the latter name, and refer to the figures of the former and descriptions of both species in E. Sismonda's "Memoirs on the Fossil Echinidæ of Nice." In that work the figures of *G. rothomagensis* accord excellently with the British species before us, and the author remarks that the distinctions between the two are very slight indeed: "Non è che per leggerissime modificazioni dei principali caratteri, che questa specie puo staccarsi dal *Galerites castanea*, di cui la tutto l'abito." Yet, assuredly, the Italian species is much closer to the original figures of "*Nucleolites*" *depressa* than to those of *Galerites castanea*. Such, in brief, is the history of our species, which, in England however, is not likely to be confounded with any other member of its genus, or to be regarded as a member of any other sub-genus than that to which we have assigned it.

The figures of the *Galerites lævis* of Agassiz in Desor's Monograph have all the appearance of being representations of a variety of this species which occurs at Warminster. M. Desor describes and figures it from the only specimen he had met with—one in the collection of M. Deshayes, from cretaceous strata in France. Mr. M'Coy, in his additions to Morris's Catalogue, mentions both *Galerites castanea* and *Galerites lævis* as British species.

British specimens of this species almost all belong to the small variety, and those which I have examined and figured are of an ovate or suborbicular form, inclining to obtusely pentagonal or hexangular. They vary much in the degree of tumidity and height as compared with the length and breadth, being sometimes nearly convex on the summit, at others depressed. The obscure angles, when they are five, correspond to the ambulacral areas; when there is a sixth, it is in the centre of the posterior or odd interambulacral space. The interambulacral areas exceed the breadth of the ambulacral by three-fifths on the middle of the sides. The sides are so rounded that their most tumid portions are central or sub-central. The base is flattened in the centre, rounded off at the sides, and has the mouth nearly in its middle. The mouth is rather small, rounded, and obscurely decago-

nal. The anus is elliptical, one-third greater in vertical dimensions than the mouth, and is placed at the hinder extremity in the lower part of the posterior interambulacral area immediately above the margin. It varies a little in degree of elevation in different specimens. Its margins are occasionally, though rarely, slightly thickened. The plates, both dorsal and ventral, are thickly covered with miliary granules, among which are distributed the spiniferous tubercles, perforated and placed on a crenulated protuberance within an areola. These tubercles are very little smaller on the dorsal surface than they are on the ventral. On the centro-lateral interambulacral plates there are from 15 to 30 tubercles. On the interambulacral areas they fall into obscure oblique ranks of three or four. In a specimen six-tenths of an inch in height, there are about 22 rows of plates to each half of an interambulacral area, and about six ambulacral plates with as many pairs of pores to each of the former.

The apical disk is composed of five genital and five ocular plates; four of the former are perforated, and one, the posterior one, imperforated and small. The left anterior genital plate is larger than the others, and produced to form the central madreporiform plate. The remainder of the disk is granulated with scattered miliary tubercles. All the ocular plates are perforated. The pairs of pores are in single file on the back and sides; but when they turn the margin to proceed down the under surface to the mouth, they gradually fall into ranks of three pair, always very oblique, and never very closely set. The spines are unknown. Internal casts exhibit the ambulacra in prominent relief.

The larger variety is found at Warminster, and is more depressed usually than the smaller. In no essential character do they differ from each other.

The following measurements of six specimens will show the variability of proportions:—

	1 ( $\alpha$ )	2 ( $\beta$ )	3 ( $\beta$ )	4 ( $\beta$ )	5 ( $\beta$ )	6 ( $\beta$ )
Length . .	$1\frac{3}{12}$	$0\frac{11}{12}$	$0\frac{11}{12}$	1	$0\frac{11}{12}$	$0\frac{9}{12}$
Breadth . .	$1\frac{1}{12}$	$0\frac{9}{12}$	$0\frac{10}{12}$	$0\frac{11}{12}$	$0\frac{10}{12}$	$0\frac{9}{12}$
Height . .	$0\frac{7}{12}$	$0\frac{7}{12}$	$0\frac{8}{12}$	$0\frac{9}{12}$	$0\frac{6}{12}$	$0\frac{6}{12}$

*Localities and Geological Position.*—This *Galerites* is characteristic of the bed of chalk marl, tinged green, with scattered particles of silicate of iron, which occurs, occupying a thickness frequently of two or three feet, at the junction of the chalk marl and green sand, and which has been described by Captain Ibbetson under the name of CHLORITIC

MARL. It is a very remarkable stratum, abounding in peculiar fossils, and containing numerous echinoderms. I have examined it and found the small variety of *Galerites castanea* plentifully near the village of Chaldon, in Dorsetshire. Mr. Morris and Captain Ibbetson have collected it in a corresponding geological position in several localities of the same county. Both larger and smaller varieties occur near Warminster.

*Foreign Distribution.*—In Savoy and in Normandy, apparently always in the same geological horizon as in England.

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#### DESCRIPTION OF THE PLATE.

Figs. 1, 2, 3, 4. Various positions of a perfect example from Dorsetshire of the tumid form of var. *Minor*.

Fig. 5. Internal cast.

Fig. 6. Ambulacral and interambulacral plates and their sculpture, taken from the centre of the sides.

Fig. 7. Arrangement of the pairs of pores in the neighbourhood of the mouth.

Fig. 8. Diagram showing the relative position of the pores and avenues.

Fig. 9. Anus.

Fig. 10. Primary tubercle and granules, highly magnified.

EDWARD FORBES.

June, 1850.



